

## REMARKS

This application has been reviewed in light of the Office Action mailed on April 23, 2003. Claims 1-13 are pending in the application with Claims 1 and 13 being in independent form.

Claims 1-13 were rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,327,049 issued to Smolka et al. in view of U.S. Patent No. 5,325,024 issued to Piejak et al.

Independent Claims 1 and 13 have been amended herein to better define Applicants' invention and to patentably distinguish Applicants' invention over Smolka et al. in view of Piejak et al. In particular Claim 1 now recites:

A high-efficiency low-pressure gas discharge lamp which includes a discharge vessel (1) and at least two spatially separated capacitive coupling-in structures (2) and operates at an operating frequency  $f$ , characterized in that each capacitive coupling-in structure (2) is formed by at least one dielectric having a thickness  $d$  and dielectric constant  $\epsilon$ , each dielectric being subject to the condition  $d/(f\epsilon) < 10^{-8}$  cm.s thereby providing high luminous flux in a small structural volume. (Emphasis Added)

Applicants' low pressure gas discharge lamp is structured to achieve a high efficiency in conjunction with a small structural volume, a high luminous flux, a low operating voltage, a low electromagnetic emission and a high resistance against switching transients and a long service life. The advantages recited above are achieved in the low pressure gas discharge lamp of the present invention by utilizing at least two spatially separated capacitive coupling-in structures, operating at a frequency  $f$ , wherein each capacitive coupling-in structure is formed by at least one dielectric having a thickness  $d$  and a dielectric constant  $\epsilon$ , where each dielectric is subject to the condition  $d/(f\epsilon) < 10^{-8}$  cm.s, as recited in Claim 1. The condition  $d/(f\epsilon) < 10^{-8}$  cm.s can be written equivalently

as a condition regarding the voltage drop over the dielectric,  $U_C < I/(2\pi\epsilon_0 A)10^{-8}$  cm.s.

The equivalence of which can be amply provided upon request. Using typical values for the current  $I$  of 10 mA and the dielectric's surface  $A$  of  $0.3 \text{ cm}^2$ , the equivalent condition  $U_C < I/(2\pi\epsilon_0 A)10^{-8}$  cm.s yields a voltage  $U_C < 600 \text{ V}$ . Further taking into consideration the fact that there are two dielectric coupling-in structures, the lamp's driver is required to supply  $(2U_C + U_P)$ ,  $U_P$  being the plasma voltage, typically in the range of 400 – 800 V. For the exemplary values of  $I=10 \text{ mA}$  and  $A = 0.3 \text{ cm}^2$ ,  $U_C$  is restricted as:  $U_C < 600 \text{ V}$ . It follows that  $2*U_C < 1200 \text{ V}$ . Thus, it is shown that  $2*U_C$  is substantially in the same range as the plasma voltage  $U_P$  of around 600 V. Increasing  $U_C$  beyond 600 V leads to several drawbacks:

- (1) The idle power (over the capacitance of the dielectrics) increases in relation to the real power (the power deposited within the plasma due to its Ohmic resistance). But the electric utilities supplying the power typically insist on feeding purely Ohmic consumers. Accordingly, the driver has to be more complex.
- (2) The driver has to supply the sum voltage of  $(2 U_C + U_P)$ , higher sum voltages lead to a more complex driver.
- (3) A higher sum voltage will also typically lead to more losses in the driver and more problems concerning electromagnetic emission.

These drawbacks are obviated through the use of at least two spatially separated capacitive coupling-in structures wherein each structure is formed by at least one dielectric having a thickness  $d$  and a dielectric constant  $\epsilon$ , where each dielectric is subject to the condition  $d/(f\epsilon) < 10^{-8}$  cm.s, as recited in Claim 1.

It is respectfully submitted that Smolka et al. and Piejak et al., taken alone or in combination, do not disclose or suggest Applicants' invention as recited by Claim 1. In particular, Smolka et al. and Piejak et al., do not disclose or suggest a low pressure gas discharge lamp having at least two spatially separated capacitive coupling-in structures, operating at a frequency  $f$ , wherein each capacitive coupling-in structure is formed by at least one dielectric having a thickness  $d$  and a dielectric constant  $\epsilon$ , where each dielectric is subject to the condition  $d/(f\epsilon) < 10^{-8}$  cm.s, as recited in Claim 1. Accordingly, withdrawal of the rejection under 35 U.S.C. §103(a) with respect to Claim 1 and allowance thereof are respectfully requested.

Claim 13 recites features which are found in Claim 1. Hence, for at least the same reasons given for Claim 1, Claim 13 is believed to be allowable over Smolka et al. and Piejak et al., taken alone or in combination.

Claims 2-12 depend from independent Claim 1 and therefore contain the limitations of Claim 1. Hence, for at least the same reasons given for Claim 1, Claims 2-12 are believed to be allowable over Smolka et al. in view of and Piejak et al. Accordingly, withdrawal of the rejection under 35 U.S.C. §103(a) with respect to Claims 2-12 and allowance thereof are respectfully requested.

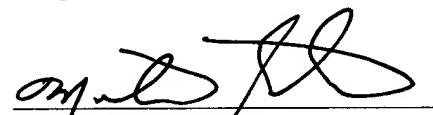
Further, Claim 2 is believed to be allowable not only due to its respective dependency from Claim 1 but also due to the fact that it recites patentable subject matter in its own right. For example, Claim 2 as amended recites that *at least one dielectric is subject to the condition  $d/(f\epsilon) < 10^{-9}$  cm.s thereby allowing the at least two spatially separated capacitive coupling-in structures (2) to operate as a ballast.* When the condition  $d/(f\epsilon) < 10^{-9}$  cm.s is satisfied, the voltage  $U_C$  is no longer considerably smaller

than the plasma voltage  $U_p$ , hence the U-I characteristic of the discharge lamp and capacitive coupling-in structures will be dominated by the capacitances. In this case, the U-I characteristic will be positive which allows the capacitive coupling-in structures to be used to ballast the lamp, i.e., self-ballasting. A ballast element can then be dispensed with in the lamp drive circuit, offering a substantial cost savings. Moreover, the self-ballasting of the lamp makes it possible to operate a plurality of such lamps in parallel while using a single driver, which leads to further cost savings of the driver.

In view of the foregoing amendments and remarks, it is respectfully submitted that all claims presently pending in the application, namely, Claims 1 – 13 are believed to be in condition for allowance and patentably distinguishable over the art of record.

If the Examiner should have any questions concerning this communication or feels that an interview would be helpful, the Examiner is requested to call Dicron Halajian, Esq., Intellectual Property Counsel, Philips Electronics North America Corp., at 914-333-9607.

Respectfully submitted,



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